EFFECT OF SEEDLINGS AND FERTILIZER AMOUNT ON PHOTOSYNTHETIC PRODUCTIVITY OF WHEAT

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Abstract. Water is a huge factor in photosynthesis. Because water is the main oxidative substrate - the source of hydrogen for the absorption of molecular oxygen and SO_2 released into the air.

Key words: Chloroplast pigments, Chlorophylls, carotenoids; phycobilins.

Introduction. The reactions of the first stage of photosynthesis take place only with the participation of light. This process begins with the absorption and assimilation of another auxiliary light, chlorophyll a. As a result, water breaks down under the influence of light energy, molecular oxygen is released, NADF.N2 (dihydronicotinamide-adenine-dinucleotide phosphate) and ATF (adenosine triphosphate) are formed.

Light energy. Light energy has the character of electromagnetic vibration. It separates and propagates only as quanta or photons. Each quantum of light has a certain energy source. This amount of energy mainly depends on the wavelength of light and is determined by the following formula.

E=hc

where E-quantum energy, in joules (kDJ), h-constant of light, constant number 6.2619 x10-34 Dj/s,-wavelength, s-speed of light 3. 1010 cm/s.

Chloroplasts. The reason why photosynthesis takes place mainly in leaves and partly in young branches is the presence of chloroplasts in them. The photosynthetic system of plants is embodied in chloroplasts. Chloroplasts prepare organic substances, a source of chemical energy for all living organisms.

Chloroplasts contain a lot of water, on average it is 75%. The rest consists of dry matter. Proteins account for 35-55% of total dry matter, lipids for 20-30%, and the rest for mineral substances and nucleic acids. Chloroplasts contain many enzymes and all pigments involved in photosynthesis.

The number, shape, and size of chloroplasts of different plants differ from each other. Chloroplasts can be formed in the leaves of green plants in three different ways:

1) by simple division;

2) by budding as a result of disruption of the normal conditions of some cells;

3) reproduction through the cell nucleus.

This road is considered the main one. First, a very small bump appears on the membrane of the cell nucleus. It gradually enlarges, separates from the nuclear membrane, moves to the cytoplasm of the cell, and is fully formed there. In the dark, the stroma of chloroplasts and its size are formed. But the internal structure - lamellae, plates, granules, thylakoids and chlorophyll pigments are formed only in light.

Pigments found in chloroplasts are mainly divided into three classes:

1) chlorophylls;

2) carotenoids;

3) phycobilins.

Chlorophylls. For the first time, in 1817, French chemists P. J. Pelt'e and J. Quantular isolated a green pigment from a plant leaf and called it chlorophyll. It is derived from the Greek words "chloros" for green and "phyllon" for leaf.

In 1906-1914, the German chemist R. Wilstetter, as a result of a comprehensive study of the chemical composition of chlorophyll, determined the elemental composition: chlorophyll "a" - C55N72O5I4Mg and chlorophyll "b" C55H70O6N4Mg. German biochemist G. Fischer determined the structural formula of chlorophyll in 1930-1940.

Higher plants and algae have been found to contain chlorophylls such as "a", "b", "c". Of these, chlorophyll "a" and "b" are synthesized in most plants. They also differ in color. Chlorophyll "a" is dark green, and chlorophyll "b" is more yellow-green. Chlorophyll "a" in normally developed leaves is about 1.2-1.41.

Photosynthetic rate is defined as the amount of SO2 or organic matter produced per square meter or dm2 of leaf surface per hour.

Light. Light is the main driving force of photosynthesis, and its intensity and spectral composition are of great importance. 80-85% of active (400-700 nm) rays in the light spectrum are absorbed by leaves. But only 1.5-2% of it is used for photosynthesis. 45% of the remaining energy is used for transpiration and 35% as heat energy.

In 1880, A.S. Faminsin showed that photosynthesis can take place in the lowest light, even in the light of a kerosene lamp. According to some scientists, photosynthesis continues even when the light is weak in the evening and in some regions at night (white night).

The light-saturated (maximum) state of photosynthesis depends on the plant species. This level is much higher in light-loving plants, and lower in shade-tolerant plants. For example, in some shade-tolerant plants (marchansia moss), the light-saturated state of photosynthesis occurs when the light is 1000 lk, and in light-loving plants, it occurs at 10,000-40,000 lk.

The spectral composition of light rays also plays an important role in photosynthesis. Under the influence of the red rays of the spectrum, the rate of photosynthesis takes place at the highest level. Because the energy of one quantum of these rays is equal to 42 kcal mol, it moves the chlorophyll molecule to an excited state, and its energy is fully used for photochemical reactions.

Concentration of carbon dioxide. One of the most necessary compounds for photosynthesis is SO_2. Its amount in air is 0.03%. 550 kg of SO_2 is contained in 100 m of air layer above one hectare of land. During one day, plants absorb 120 kg of SO_2. But the amount of SO_2 in the atmosphere keeps the constant amount of carbon dioxide present in nature. Even the gradual increase of SO_2 in the atmosphere is noticeable.

Increasing the amount of SO_2 in the air from 0.03% to 0.3% also increases the rate of photosynthesis. Feeding plants with supplemental SO_2 is particularly beneficial for agricultural crops grown in greenhouses. It has been found that increasing the amount of SO_2 in the air in greenhouses to 0.2-0.3% has a good effect on vegetable plants, and their productivity can increase by 20-50% and even up to 100%.

In plants that spend most of their ontogeny in extremely dry conditions, photosynthesis goes by the S_4 pathway, and they absorb SO_2 and accumulate malic acid (malate) mainly at night (when the stomata are open). Because their mouths are closed during the day. Closed mouths prevent the water in their body from being used for transpiration.

At night, when the stomata are open, SO_2 and SO_2 released during respiration combine with phosphoenolpyruvate to form oxaloacetate (osc) with the help of enzymes (FEP-carboxylase). Oxaloacetic acid is converted into malate with the help of NADF and accumulates in cell vacuoles. During the day, when the air is very hot and the stomata are closed, malate moves into the cytoplasm, where it is broken down into SO_2 and pyruvate by the enzyme malate dehydrogenase. The formed SO_2 moves to chloroplasts and participates in the formation of sugars according to the Calvin cycle. The resulting pyruvic acid (FGK) is also used for the formation of starch.

This way of photosynthesis mainly occurs in representatives of the family of succulents (Crassulaceae) (cacti, agave, aloe, etc.) that are resistant to severe drought. It is called the SAM way, based on the English concept of Crassulaceae oeid metalolism.

The level of temperature points depends on the plant species. The minimum temperature is -15°C for plants growing in northern latitudes (pine, spruce, etc.), and 4-8°C for tropical plants. For most plants, the most intensive photosynthesis occurs when the temperature is 25-35°C. The increase in temperature also slows down photosynthesis and stops when it reaches 40°C.

When the temperature reaches 45°C, some plants begin to die. In some plants living in deserts and hills, photosynthesis does not stop even at 58°C.

Water is a source of hydrogen for the absorption of molecular oxygen and SO_2 released into the air, the main oxidative substrate.

Too much or too little water in the leaf tissues (especially in drought conditions) affects the closing of the stomata and, as a result, the rate of photosynthesis. The long-term continuation of water scarcity or deficiency negatively affects the processes of cyclic and non-cyclic transport of electrons, phosphorescence in light, formation of ATFs.

Root nutrition. Many elements (N, R, K, Sa, S, Mg, Fe, Mn, Si, Zn, AI, etc.) are absorbed from the soil through the roots of plants. These elements are part of chloroplasts, pigments, enzymes, proteins, fats, carbohydrates and others. In conditions where nitrogen and phosphorus are lacking, the structural structure of chloroplasts begins to decay. The synthesis process of pigments slows down and even stops.

As a result of a lack of phosphorus in food, the reactions of photosynthesis in light and darkness may be disturbed. The degree of supply of plants with mineral elements determines the productivity of photosynthesis. Providing them with enough mineral elements increases absorption and assimilation of light energy, effective use of SO_2.

In all plants, the process of photosynthesis takes place under aerobic conditions. That's why anaerobic conditions and the amount of oxygen in the air more than 21% have a negative effect on photosynthesis. In plants with a strong respiration process in the light (Sz plants), a decrease in the amount of oxygen from 21% to 3% accelerated photosynthesis, in plants with a weak respiration process in the light (S» plants) - it was found that photosynthesis did not change.

An increase in the concentration of oxygen in the atmosphere by 25-30% reduces photosynthesis and causes the acceleration of light respiration.

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